

REMARKS

Claim Amendment

Base Claims 1, 46 and 51-55 are amended to recite that the portion of the outgassed contaminants is transferred into the purified purge gas by diffusion or desorption. Support for this amendment is found in the International Application as filed, WO2004/112117, on page 9, lines 1-12.

This amendment is also supported by the disclosure of U.S. Provisional Application 60/475,145 (“the ’145 Application”). Referring to the PDF document available on USPTO PAIR database, Applicants refer, for example to:

- page 4, the “Abstract” paragraph, which teaches that the contaminants are *absorbed* into the purge gas:

The total hydrocarbon load that is absorbed under nitrogen purge is compare to that *absorbed* with XCDA. (*Emphasis added.*)

- page 9, the “Procedure” paragraph, which teaches that contaminants are *desorbed*:

As the gas is purged through the VUT, any *desorbed* contaminants are collected downstream in the cold trap for hydrocarbon analysis. (*Emphasis added.*)

- page 14, the third full paragraph, which teaches that contaminants *diffuse* from the contaminated surfaces:

This butterfly effect augments the increased thermal *diffusion* rate that is seen in nitrogen. (*Emphasis added.*)

Rejection of Claims 53 and 55 Under 35 U.S.C. §112, First Paragraph

Claims 53 and 55 are rejected under 35 U.S.C. §112, first paragraph as failing to comply with the description requirement. The Examiner stated that the ’145 Application, to which the instant application claims priority, does not describe the subject matter of Claims 53 and 55.

The Examiner stated that Claim 53 is directed to outgassing an organic contaminant by contacting a surface by a purified purge gas that contains oxygen and water. The Examiner stated that Applicants argued that Claim 53 is supported by the description on page 15 of the ’145 Application of passing Extra Clean Dry Air through a bubbler containing ultra-high purity

water. The Examiner stated that the description on page 15 of the '145 Application does not support Claim 53 because the '145 Application teaches using the bubbler to avoid electrostatic buildup rather than “using oxygen in combination with water to perform the claimed methods.” (Office Action, page 2, section 3.)

With respect to Claim 55, the Examiner stated that neither the specification of the instant application, nor the '145 Application teach dehumidifying the purified purge gas, as required by Claim 55.

Applicants disagree. The Examiner's inquiry into the stated objective of an affirmatively recited step of “drying” and “remoisturizing” is irrelevant to the determination of written support. The portion of the specification of the '145 Application relied upon by Applicants states:

It is possible to add a bubbler or other wetting device for dry XCDA gas – avoids electrostatic buildup – therefore you dry the XCDA and then remoisturize it with ultrapure H₂O to discharge static electricity[.] (The '145 Application, second to last page, last paragraph. *Emphasis added.*)

This description clearly teaches both drying and remoisturizing (*i.e.* adding water) to XCDA, an embodiment of a purge gas. Avoiding electrostatic buildup is just one of the objectives and benefits of first drying and then remoisturizing purge gas. Regarding Claim 55, Applicants additionally note that not only does the above-quoted paragraph expressly teach drying XCDA, but, in fact, the very same page of the '145 Application describes XCDA as “atmospheric air with reduced content of components - < 1 ppm H₂O.” (The '145 Application, second to last page, third paragraph.) Reduction in water content is also known as dehumidifying, as recited in Claim 55.

The Examiner's statement that the '145 Application does not teach “using oxygen in combination with water to perform the claimed methods” is not understood. The '145 Application teaches the use of a purge gas containing oxygen (*e.g.*, XCDA), instead of the ultra-high purity nitrogen, to purge contaminants from surfaces in a semiconductor manufacturing process. The '145 Application also teaches that the purge gas can be dried and then remoisturized (as discussed above). Thus, the '145 Application clearly teaches “using oxygen in combination with water to perform the claimed methods.”

Reconsideration and withdrawal of the rejection are respectfully requested.

Rejection of Claim 53 Under 35 U.S.C. §112, Second Paragraph

Claim 53 is rejected under 35 U.S.C. §112, second paragraph, as indefinite. The Examiner stated that it is unclear how the “outgassing rate” can be expressed as a concentration value (“of 1 ppt or less”).

Applicants clarify that where, as in Claim 53, it is stated that “outgassing rate at the surface of a component ... is reduced to 1 ppt or less,” it means that the concentration of the contaminant at the surface of the component decayed down to the level of “at or below 1 ppt.”

Applicants direct the Examiner’s attention to the instant specification, page 15, line 29 through page 17, line 2 (Example 1), which describe the experimental setup for measuring outgassing of substrates. In particular, the paragraph on page 16, lines 11-19, makes it clear that what is being measured is the “concentration decay” of a contaminant in a purge gas. The Examiner next is directed to the paragraph on page 22, lines 5-19 of the instant specification. This paragraph describes the measurements similar to the ones of Example 1. Here, various substrates produced different outgassing profiles (*e.g.*, starting at 100 ppt and peaking at 1000 ppt) but eventually reached the level of degassing that produced the concentration of contaminants below 1 ppt (as proven by the failure of measuring the outgassing concentration as it fell below the limit of detection). As such, this describes an embodiment of the method defined by Claim 53, which recites that the steps are repeated “until the outgassing rate ... is reduced to 1 ppt or less.”

In view of the above-described portions of the specification, Claim 53 cannot be deemed indefinite. Reconsideration and withdrawal of the rejection are respectfully requested.

Rejection of Claims Under 35 U.S.C. §103(a)

The Examiner maintained the following rejections of the pending under 35 U.S.C. §103(a) as being unpatentable over a combination of references.

(1) Claims 1, 3-4, 8-9, 11, 38, 41, 43-47 and 53-54 are rejected over U.S. 6,427,703 (“Somekh”) in view of U.S. 6,610,123 (“Wu”) and further in view of U.S. 6,391,090 (“Alvarez”).

(2) Claim 14-15, Claim 40 and Claim 50, all dependent on Claim 1, are rejected over Somekh, Wu and Alvarez, in further view of U.S. 6,724,460 (“Van Schaik”).

(3) Claims 1, 3-4, 8-9, 11, 38, 40-41, 43-47 and 51-54 are rejected over US 2005/0017198 (“Van Der Net”) in view of Alvarez.

(4) Claim 14-15, Claim 40 and Claim 50, all dependent on Claim 1, are rejected over Van Der Net, in view of Alvarez and further in view of Van Schaik.

(5) Claims 52 and 53 are rejected over Van Schaik in view of Alvarez.

Van Der Net is NOT Prior Art Against the Claimed Invention

Applicants recapitulate their position that Van Der Net is not prior art with respect to the claimed invention. Van Der Net does not constitute prior art at least with respect to base Claims 1, 46 and 51-55, as amended. The prior art date of Van Der Net is its filing date of July 21, 2003. The present application claims the benefit of U.S. Provisional Application No. 60/475,145 filed on June 2, 2003.

As Applicants explained in their Amendment filed March 30, 2010 and as further clarified above, the disclosure of the '145 Application fully supports the base claims, including the features of the purge gas comprising oxygen and water, drying the purge gas followed by remoisturizing it, as well as removal of the contaminants by diffusion or desorption.

Since Van Der Net does not constitute prior art, the rejections that rely on Van Der Net are improper.

Furthermore, Applicants maintain the arguments as set forth in the Reply dated April 30, 2009, the Reply dated November 30, 2009 and the Reply dated March 30, 2010: even assuming, *arguendo*, that Van Der Net is a prior art reference to the pending claims, a person of ordinary skill in the art would not have been motivated to combine the teachings of Van Der Net and Alvarez. Van Der Net teaches adding moisture to a purge gas to make it effective in reducing contamination, while Alvarez states that it is important to effectively remove water. As stated by the Examiner, Van Der Net teaches that the purge gas can have an amount of moisture within the range of 0-100% and that as one possible embodiment the purge gas of Van Der Net could have water in the ppm range. The Examiner’s argument that “as one possible embodiment” the purge gas could have water in the ppm range ignores the requirement of a reasonable expectation of

success, as set forth in MPEP 2143.02. Given the fact that Van Der Net teaches that more than 25% relative humidity provides good results and about 40% provides optimal results, a person of ordinary skill in the art would not have had a reasonable expectation of success, based on the combined teachings of Van Der Net and Alvarez, in employing a water concentration in the ppm range, as suggested by the Examiner. Indeed, to carry out the invention of Van Der Net effectively, the reference requires the presence of water in an amount greater than that disclosed by Alvarez (*i.e.*, the order of 1 ppb or lower; col. 7, lines 8-9 of Alvarez). Thus, the Examiner's proposed modification of Van Der Net in view of Alvarez renders the invention of Van Der Net unsatisfactory for its intended purpose.

In view of the above, reconsideration and withdrawal of rejections (3) and (4), listed above, are respectfully requested.

Somekh, Wu and Alvarez

Applicants amended base Claims 1, 46 and 51-55 to recite that the portion of the outgassed contaminants is transferred into the purified purge gas by diffusion or desorption. Thus, in various embodiments, the present application is directed to methods of removing contaminants (*e.g.*, airborne molecular contaminants (AMC) or organic contaminants, as recited in Claim 53) from a surface by desorbing or diffusing such contaminants from the surface into a stream of the purified purge gas. In certain embodiments, the purified purge gas is Extra Dry Clean Air (XCDA).

In relying on desorbing or diffusion, the claimed methods exclude chemically altering or reacting with the contaminants. Such exclusion confers onto the claimed methods clear benefits, such as the ability to measure the concentration and to define the identities of the contaminants. (*See, e.g.*, PCT application as published, WO 2004/112117, page 10, lines 19-25.) Additional benefits include ease of setup and handling the purge gas and its purification process, elimination of reactive, potentially corrosive, components of the purge gas, and absence of undesirable byproducts of a chemical reaction.

In contrast, Somekh discloses removing carbon deposits from equipment by reacting the carbon deposits to form a volatile gas species. (*See* Somekh col. 3, lines 13-45.) To eliminate the carbon deposits, Somekh discloses transforming the surface carbon deposits into an oxidized

carbon gas, namely carbon monoxide (CO) and carbon dioxide (CO₂) (col. 5, lines 34-41). Somekh discloses providing an oxidizer in an activated state using methods such as thermal activation, microwave activation, plasma discharge, and ozone activation (col. 6, lines 38- 45) to chemically transform the carbon deposits into CO and CO₂ and subsequently removing the different gaseous entities (col. 5, lines 33-40). Thus, Somekh fails to teach that the portion of the outgassed contaminants is transferred into the purified purge gas by diffusion or desorption, as required by base Claims 1, 46 and 51-55, as amended.

The secondary references of Wu and Alvarez, relied upon by the Examiner for their teachings of Clean Dry Air (Wu) and the purity of purge gas of less than 1ppb (Alvarez), provide neither suggestion nor motivation to modify Somekh by replacing a purge gas comprising an “oxidizer” with a non-reactive purge gas. In fact, such a modification of Somekh would render the method disclosed in this reference inoperative.

Additionally, Wu teaches that water and oxygen, which are the ingredients of the purge gas required by the pending claims, are harmful at certain photolithography exposure wavelengths because these species are optical contaminants (see *e.g.*, Wu, column 6, lines 24-32). Moreover, Wu teaches that for certain applications, Clean Dry Air is unacceptable and helium or nitrogen should be selected instead as purge gases (column 2, lines 45-49). As such, Wu does not direct one of ordinary skill in the art to select an oxygen-containing purge gas and to then further modify it by, *e.g.* adding water.

Similarly, as explained by Applicants in their previous responses, Alvarez provides no motivation to use a purge gas that contains water since this reference teaches that “effective removal of water is of utmost importance” (Alvarez, column 8, lines 3-4).

In view of the above, the combination of Somekh, Wu and Alvarez neither teaches the elements of the claimed invention, nor suggests modifying the respective teachings in the manner necessary to arrive at the claimed invention. As such, base Claims 1, 46 and 51-55 as amended, as well as claims dependent thereon are patentable. Reconsideration and withdrawal of the rejection are respectfully requested.

Somekh, Wu, Alvarez, and Van Schaik

Somekh, Wu and Alvarez are characterized above. Van Schaik, like Somekh, teaches removal of contaminants by chemically modifying them. Specifically, as explained in column 4, lines 9-20, Van Schaik teaches adding oxygen-containing species to the purge gas, UV-irradiating the gas to produce atomic oxygen, and using this atomic oxygen to clean optical components of a lithographic projection apparatus. One of ordinary skill in the art would appreciate that atomic oxygen would chemically react with the contaminants. As such, Van Schaik does not remedy the failure of the combination of Somekh, Wu and Alvarez to teach or suggest the claimed invention.

In view of the above, base Claims 1, 46 and 51-55 as amended, as well as claims dependent thereon are patentable. Reconsideration and withdrawal of the rejection are respectfully requested.

Van Schaik in view of Alvarez

Claims 52-53 stand rejected over Van Schaik in view of Alvarez.

Applicants amended independent Claims 52-53 to recite that the portion of the outgassed contaminants is transferred into the purified purge gas by diffusion or desorption. Van Schaik and Alvarez are characterized above. Van Schaik teaches removal of contaminants by chemically modifying them. Alvarez provides neither suggestion nor motivation to modify Van Schaik by removing oxygen-containing species to the purge gas. In fact, such a modification of Van Schaik would render the method disclosed in this reference inoperative. Additionally, Alvarez provides no motivation to use a purge gas that contains water, as required by Claims 52 and 53, since this reference teaches that “effective removal of water is of utmost importance” (Alvarez, column 8, lines 3-4).

In view of the above, independent Claims 52 and 53, as amended, are patentable. Reconsideration and withdrawal of the rejection are respectfully requested.

Double Patenting Rejections

The Examiner rejected claims 1, 3-5, 11, 14-15, 38, 40-41, 43-45, 50 and 52-54 on the ground of nonstatutory obviousness-type double patenting over claims 1-4, 7, 9-14, and 20-23 of

U.S. Patent No. 7,189,291. Applicants will address this issue upon indication of allowable subject matter.

The Examiner rejected claims 1, 3, 8, 11, 14-15, 38, 41, 43, 46 and 50-54 on the ground of nonstatutory obviousness-type double patenting over claims 1, 6, 11-21 and 23-24 of U.S. Patent No. 7,377,982. Applicants will address this issue upon indication of allowable subject matter.

Information Disclosure Statement

A Supplemental Information Disclosure Statement (SIDS) is being filed concurrently herewith. Entry of the SIDS is respectfully requested.

CONCLUSION

In view of the above amendments and remarks, it is believed that all claims are in condition for allowance, and it is respectfully requested that the application be passed to issue. If the Examiner feels that a telephone conference would expedite prosecution of this case, the Examiner is invited to call the undersigned.

Respectfully submitted,

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